Cobra®

Operating Instructions

The Cobra line of quality products includes:

- **CB Radios**
- **microTALK® Radios**
- **Radar/Laser Detectors**
- **Safety Alert® Traffic Warning Systems**
- **Mobile GPS Navigation Systems**
- **HighGear® Accessories**
- **CobraMarine® VHF Radios**
- **CobraMarine® Chartplotters**
- **Power Inverters**
- **Accessories**

400 WATT POWER INVERTER

CPI 480

Introduction

Our Thanks to You

Thank you for purchasing the Cobra CPI 480 inverter. Properly used, this Cobra product will give you many years of reliable service.

How Your Cobra Power Inverter Works

The Cobra power inverter is an electronic product that has been designed and built to take low voltage DC (Direct Current) power from your automobile or other low voltage power supplies and convert it to standard 115 Volt AC (Alternating Current) power like the current you have in your home. This conversion process thereby allows you to use many of your household appliances and electronic products in automobiles, RVs, boats, tractors, trucks and virtually anywhere else.

Important Safety Information

Before installing and using your Cobra power inverter, please read these general precautions and warnings.

Caution and Warning Statements

To make the most of this inverter, it must be installed and used properly. Please read the installation and operating instructions carefully before installing and using it. Special attention must be paid to the **CAUTION** and **WARNING** statements in the manual.

CAUTION Statements specify conditions which could cause damage to the unit or other equipment.

WARNING Statements identify conditions that could result in personal injury or loss of life.

General Precautions

1. **Never install the inverter in a boat's engine compartment where gas and battery fumes are present.**
2. Do not operate the inverter if it has been dropped or damaged in any way.
3. Do not open the inverter; it contains no user-serviceable parts. Attempting to service unit could cause electrical shock.

   NOTE Internal components remain charged after all power is disconnected.
4. Do not expose the inverter to rain, snow, bilge water or spray.
5. Do not obstruct the ventilation openings.
6. Do not install the inverter in zero-clearance compartment.

CAUTION This inverter should be used in **negative ground** applications only.

Important Safety Information

WARNING Power inverters contain components that can produce arcs or sparks. To prevent fire or explosion, do not install the inverter in areas or compartments containing batteries or flammable materials or in locations that require ignition-protected equipment.

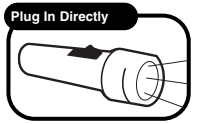
WARNING To reduce the risk of fire, do not cover or obstruct the ventilation openings. Do not install inverter in zero-clearance compartment.

Warning: Wash Hands After Handling Power Cord

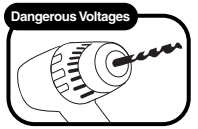
The power cord on this product contains lead, a chemical known in the state of California to cause birth defects or other reproductive harm.

Caution: Rechargeable Appliances

Certain chargers for small nickel cadmium batteries can be damaged if connected to the Cobra 400 watt inverter. Two particular types of equipment are prone to this problem:



1. Small battery-operated appliances such as flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.



2. Certain battery chargers for battery packs used in hand power tools. These chargers have a **WARNING** label stating that dangerous voltages are present at the battery terminals.

This problem does not occur with the vast majority of battery operated equipment. Most use a separate charger or transformer that is plugged into the AC receptacle and produces a low voltage output. If the label on the AC adapter or charger states that it produces a low voltage AC or DC output (less than 30 volts), the inverter will have no problem powering the adapter safely.

Quick Evaluation Before Installation

Cobra 400 Watt Output Waveform

Some very sensitive electronic equipment may not operate satisfactory on “square wave” or “modified sine wave.” The output waveform is referred to as “square wave” or “modified sine wave.” It is a stepped waveform designed to have characteristics similar to the sine wave shape of utility power. A waveform of this nature is suitable for most AC loads (including linear and switching power suppliers used in electronic equipment, transformers and motors).

Quick Evaluation Before Installation

This section provides you with basic information about the inverter and how to check its performance before installation.

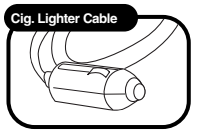
Be sure to have on hand:

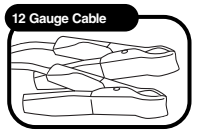
- A 12 volt DC power source (such as a vehicle battery).

The power source must provide between 11 and 15 volts DC and be able to supply enough current to run the test load. As a rough guide, divide the wattage of the test load by 10 to get the current (in amperes) the power source must deliver.

- The provided two foot cigarette lighter cable and two foot direct-to-battery 12 gauge cable.

Only use the cables provided with your inverter.
The cigarette lighter cable is suitable for operating the inverter at loads up to 150 watts. Connect by securely inserting the plug into the cigarette lighter socket.

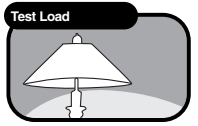




CAUTION Do not use the cigarette lighter cable for loads higher than 150 watts. When connecting loads larger than 150 watts, please connect the inverter directly to the battery.

Quick Evaluation Before Installation

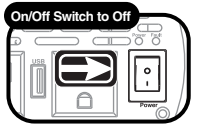
Test Load



- A test load that can be plugged into the AC receptacle on the inverter for short term testing at a low power level.

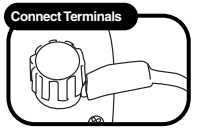
To check your inverter's performance before installation:

On/Off Switch to Off



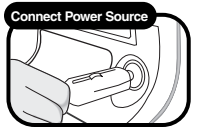
1. Turn the inverter **off** (see page 11 for details). If the power source is a DC power supply, switch it **off** as well.

Connect Terminals



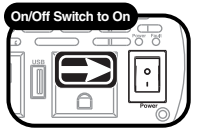
2. Connect cables to power input terminals (see page 6 for details).
3. Connect cable to power source (see page 8 for details).
4. Check to make sure all connections are secure.

Connect Power Source



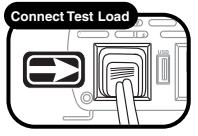
5. Turn the inverter **on**. If the power source is a DC power supply, switch it **on** first.
6. Plug in the test load.

On/Off Switch to On

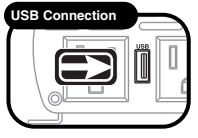


The inverter should supply power to the load. If the inverter is not working properly, refer to the troubleshooting guide on page 14 or power and protection indicators section on page 12.

Connect Test Load



USB Connection



Installation Requirements

Installation Requirements

The inverter must be installed in an area that meets all of the following requirements:

A. Dry
Do not place in an area where water can drip or splash on the inverter.

B. Cool
Ambient air temperature should be between 30°F and 105°F (0°C and 40°C). The cooler the better.

C. Ventilate
Allow at least one inch (three cm) of clearance around the inverter for proper airflow. Make sure that ventilation openings on the ends of the unit are not obstructed.

CAUTION To avoid fire, do not cover or obstruct ventilation openings. Do not install inverter in a zero-clearance compartment. Overheating may result.

CAUTION The inverter must only be connected to batteries with a nominal output voltage of 12 volts. It will not work with a 6 volt battery, and will be damaged if it is connected to a 16 volt battery.

WARNING This unit contains components which can produce arcs or sparks. To prevent fire or explosion, do not install in compartments containing a battery or flammable materials, or in a location which requires ignition protected equipment.

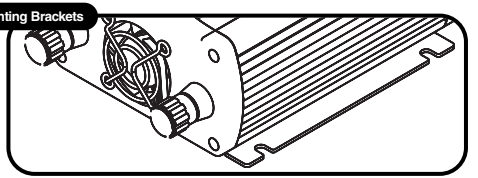
Mounting and Connecting Cables

Mounting

To mount your inverter:

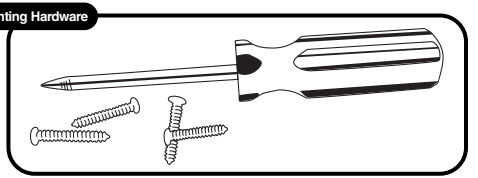
1. Place the inverter on a flat surface with the mounting bracket against the mounting surface.

Mounting Brackets



2. Mount to secure surface using mounting hardware that is corrosion resistant (not included).

Mounting Hardware

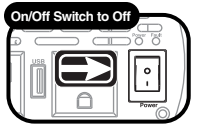


The inverter can be mounted horizontally or vertically.

Connecting Cables

Power wire and wiring are very important to the performance of the inverter. Because the inverter has a low voltage, high current input, low resistance wiring is essential between the battery and inverter. This is so it can deliver the maximum amount of energy to the load. **Only use the cables provided with your power inverter**.

On/Off Switch to Off



To connect the cables between the inverter and the battery:

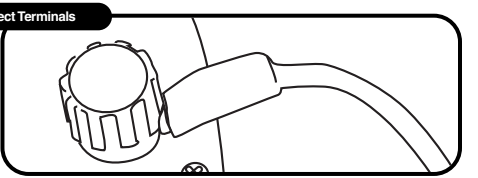
1. Turn the **On/Off Switch** on the inverter to the **off** position. If the power source is a DC power supply, switch it **off** as well.

Installation

Connecting Cables

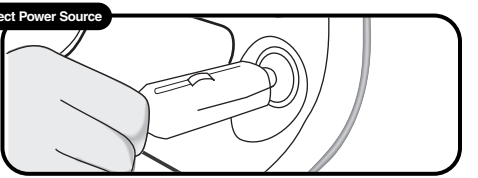
2. Connect cable to the **Power Input Terminals** on right side panel of the inverter. The red terminal is positive (+) and the black terminal is negative (-). Insert the ends of the cables onto the terminals and tighten the screws to clamp the cables safely.

Connect Terminals



3. Connect cable to your vehicle's cigarette lighter socket.

Connect Power Source



NOTE If the inverter is to be used at levels above 150 watts for extended periods of time, a direct connection to the battery is recommended. Do not use the cigarette cord for loads higher than 150 watts. Please contact your local dealer or customer assistance for the proper cord for direct to battery connections.

CAUTION Reverse polarity connections (positive to negative) will blow inverter fuses and may permanently damage the unit. Such damage is not covered by the warranty.

CAUTION Remove any jewelry (watch, ring, etc.). Be careful not to short circuit the battery with any metallic object (wrench, etc.).

Connecting Cables

WARNING You may observe a spark when making the connection because current can flow to charge the capacitors in the inverter. **Do not make this connection in the presence of flammable fumes.** Explosion or fire may result. Thoroughly ventilate the battery compartment before making this connection.

3. Connect cable to the power source:

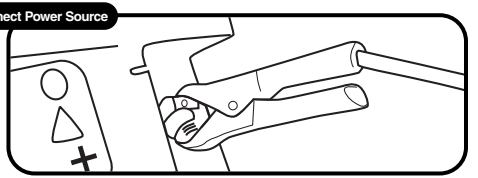
a. Connect the cable from the **Negative (Black) Terminal** of inverter to the **Negative Terminal** of the power source. Make a secure connection.

b. Connect the cable from the **Positive (Red) Terminal** of the inverter to the **Positive Terminal** of the power source (the battery's main fuse or the battery selector switch, if you are using one). Make a secure connection.

You might observe a spark when you make this connection since current can flow to charge capacitors in the inverter.

All power connections to your Cobra inverter must be **Positive to Positive** and **Negative to Negative**.

Connect Power Source



Installation

Connecting Cables

CAUTION Do not connect the inverter and another AC source (such as a generator or utility power) to the AC wiring at the same time. The inverter will be damaged if its output is connected to AC voltage from another source. Damage can even occur if the inverter is switched **off**.

CAUTION Do not connect the inverter to an AC branch circuit that has high-power consumption loads. It will not operate electric heaters, air conditioners, stoves, and other electrical appliances that consume more than 400 watts.

CAUTION Loose connectors result in excessive voltage drop and may cause over heated wires and melted insulation.

CAUTION Reverse polarity connections (positive to negative) will blow external fuse in the inverter and may permanently damage the unit. Such damage is not covered by the warranty.

CAUTION Remove any jewelry (watch, ring, etc.). Be careful not to short circuit the battery with any metallic object (wrench, etc.).

WARNING 115 volt AC power is potentially lethal. Do not work on AC wiring when it is connected to the inverter (even if it is switched off) unless the DC power source is physically disconnected from the inverter. Also, do not work on AC wiring if it is connected to another AC power source such as a generator or the utility line.

WARNING You may observe a spark when making the connection because current can flow to charge the capacitors in the inverter. **Do not make this connection in the presence of flammable fumes.** Explosion or fire may result. Thoroughly ventilate the battery compartment before making this connection.

Power Consumption

Power Consumption

For each piece of equipment you will be operating from the inverter, you must determine the battery's **reserve capacity** (how long the battery can deliver a specific amount of current — in automotive batteries, usually 25 amperes) or **ampere-hour capacity** (a measure of how many amperes a battery can deliver for a specified length of time).

Example – Reserve capacity: a battery with a reserve capacity of 180 minutes can deliver 25 amperes for 180 minutes before it is completely discharged.

Example – Ampere-hour capacity: a battery with an ampere-hour capacity of 100 ampere-hours can deliver 5 amperes for 20 hours before it is completely discharged.

To determine the battery ampere-hour capacity you require:

1. Determine how many watts each piece of equipment consumes. This can normally be found on the product label. If only the current draw is given, multiply the current draw by 115 to get the watt consumption.
2. Estimate the time (in hours) that each piece of equipment will be running between battery charging cycles.
3. Calculate the total watt-hours of energy consumption (power x operating time) using the average power consumption and the total estimated running time (in hours). **Power x Operating Time = Watt-Hours**.

50 watts x 2 hours
= 100 watt-hours

115 watts x 3 hours
= 345 watt-hours

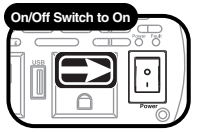
300 watts x 15 minutes
= 75 watt-hours

4. Divide the watt-hours by 10 to determine how many power supply's (12 volt) ampere-hours will be consumed.

Power On and Off

Turning Your Inverter On or Off

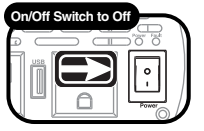
Be sure to have your power inverter properly installed before attempting to turn the unit **on** (see installation page 5).



To turn the power inverter on:

1. If a DC power supply is being used as the power source, switch it **on**.
2. On the left side panel, switch the **On/Off Switch** to **on**.

The inverter is now ready to deliver AC power to your loads. If several loads are to be operated by the inverter, turn them **on** separately, after the inverter has been turned **on**. This will ensure that the inverter does not have to deliver the starting currents required for all the loads at once.



To turn the power inverter off:

1. On the left side panel, switch the **On/Off Switch** to **off**.

NOTE The **On/Off Switch** turns the control circuit in the inverter **on** and **off**. It **does not** disconnect power from the inverter.

When the switch is in the **off** position, the inverter draws no current from the battery. When it's in the **on** position, but no power is being supplied to the load, the inverter draws less than 500 milliamperes from the battery. This is low current draw. It would take more than a week to discharge a 100 ampere-hour battery at this rate depending on the age of the battery.

Power and Protection Indicators

The power and protection indicators include a green light, a red light and an alarm.

Green Light

Power on – The green light should remain **on** steady.

Red Light and/or Alarm

Current overload – The red light will blink continuously, then the inverter will shutdown. The inverter will continue to check for appropriate current levels while trying to restart the load.

DC input voltage overload – The red light will turn on and the inverter will shutdown. The inverter will continue to check for appropriate voltage levels while trying to restart the load.

DC input voltage shortage – As a warning that the voltage is getting low, the internal alarm will sound. When the voltage is too low, the inverter will shutdown and the red light will turn **on**. The inverter will continue to check for appropriate voltage levels while trying to restart the load.

Temperature overload – The red light will blink, then the inverter will shutdown. The inverter will continue to check for appropriate temperature levels while trying to restart the load.

NOTE A momentary sound of the internal alarm and/or flash of the red light is normal at start up.

Operating Limits

Power Output

The inverter can deliver 400 watts for about 60 minutes. The inverter must cool for 15 minutes before it can resume operation at 400 watts. Note: The wattage rating applies to resistive loads.

The inverter will operate most AC loads within its power rating. Some induction motors used in freezers, pumps, and other motor-operated equipment require very high surge currents to start. The inverter may not be able to start some of these motors even though their rated current draw is within the inverter's limits. The inverter will normally start single phase induction motors rated at one-half HP or less.

Input Voltage

The inverter will operate from input voltage ranging from 10 volts to 15 volts. Optimum performance will occur when the voltage is between 12 volts and 14 volts. If the voltage drops below 10.5V+/-0.3V, an audible low battery warning will sound. The inverter will shut down if the input voltage drops below 9.5V+/-0.3V. This protects the battery from being over-discharged. It will restart when the input voltage exceeds 12V+/-0.3V.

The inverter will also shut down if the input voltage exceeds 15.75V+/-0.75V. This protects the inverter against excessive input voltage. Although the inverter has protection against over-voltage, it may still be damaged if the input voltage were to exceed 16 volts.

Troubleshooting Guide

Troubleshooting Guide

Problem/Symptom	Possible Causes	Solution
Low output voltage	Overload	Reduce the load.
No output voltage	Low input voltage	Recharge battery. Check connections and cable.
No output voltage after prolonged use	Thermal shutdown	Allow inverter to cool off.
		Reduce load, continuous operation input current required.
		Improve ventilation; Make sure ventilation openings in the inverter are not obstructed.
		Reduce ambient temperature.
No output voltage, “Protect” indicator lighted	High input voltage	Make sure the inverter is connected to 12V battery.
		Check regulation of charging system.
No output voltage	Short circuit	Check load for proper operation.
No power to inverter	Blown fuse	Replace fuse.
Low battery alarm on all the time	Poor DC wiring	Check connections.
	Poor battery condition	Make sure battery is fully charged.

Specifications

Specifications

Continuous output power (1 hour) 400W
Surge rating (0.1 second) 800W
Peak efficiency (12V – 1⁄2 load) . . . . . > 88%
Efficiency (full load, 12V) . . . . . > 83%
No load current draw . . . . . < 0.5A (12.6V)
Output waveform (resistive load) . . . Modified sine wave
Output frequency . . . . . 58HZ – 62HZ
Output voltage . . . . . 109V – 120V
USB output 5V
Input voltage . . . . . 10.4VDC – 14.4VDC
Alarm voltage (unload) . . . . . .10.2V – 10.8V
Shutdown voltage (unload) . . . . . 9.2V – 9.8V
Operating temperature range . . . . . 0°C – 40°C (32°F – 104°F)
Storage temperature range . . . . . -40°C – 85°C (-40°F – 185°F)
Protection . . . . . .Overload, short-circuit, overtemp, reverse polarity, under/over voltage

Notes

All protection is automatically recovered.

To protect the battery, if the unit needs to be restarted after low voltage protection, the voltage of DC input should be above 12V.

To extend the life of the fan, it will stop when there is no load. The speed of the fan increases as the load increases.

The unit is completely insulated in input and output for added safety.